



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/505,287 | 08/19/2004 | Willem Jan Toren | FR02 0010 US | 5180 |

7590 10/25/2006

Philips Electronics North America Corporation
Intellectual Property & Standards
1109 McKay Drive
M/S41-SJ
San Jose, CA 95131

| |
|----------|
| EXAMINER |
|----------|

AHMED, SHAMIM

| | |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

1765

DATE MAILED: 10/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--------------------------------------|--|--|
| Office Action Summary | Application No. 10/505,287 | Applicant(s) TOREN, WILLEM JAN | |
| | Examiner Shamim Ahmed | Art Unit 1765 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 8/14/06 have been fully considered but they are not persuasive. Applicant's argument is not commensurate with the claims such as claims are not limited to the intermediate layer to be only a single layer that applicant argues. So, Hause et al's teaching of depositing layers 104/106 reads on the claimed limitation of "depositing an intermediate layer of material on a substrate".

As to claim 4, applicant argues that modifying with Wolf destroy the Hause et al's teaching as Hause et al do not expressly disclose that the side-walls of the aperture are coated with low dielectric material.

In response to the argument, examiner states that the argument is not persuasive because Wolf teaches the use of low dielectric material is advantageous in the semiconductor industries and one of ordinary skilled in the art would have been motivated to do so as discussed in the rejection.

Therefore, the previous office action is repeated herein as below:

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3 and 7-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Hause et al. (U.S. Patent No. 5,843,625).

As to claim 1, Hause discloses a method of forming electrical connections on a substrate (column 1, lines 9-13), comprising the following steps: a) depositing an intermediate layer of material (104/106) on a substrate (100) (column 6, lines 15-41; Figure 2), b) forming an etching mask (108) on the intermediate layer (104/106) (column 6, lines 42-45), said mask (108) having at least one window (column 6, lines 47-49; Figure 3) having dimensions which are larger than the dimensions envisaged for the electrical connections to be realized (column 6, lines 47-49; column 8, lines 36-44), c) etching the intermediate layer of material (104/106) through the window of the mask (108) in order to form therein at least one aperture (110), having lateral side-walls (111) (column 6, lines 55-62), for receiving the electrical connections (column 8, lines 9-11; Figure 8), d) coating the lateral side-walls of the aperture with a spacer (114) in order to narrow the aperture (column 7, lines 28-33; column 8, lines 36-44), e) depositing at least one conductor material (125) so as to fill the narrowed aperture (column 8, lines 9-11; Figure 8), and f) performing an abrasion operation in order to remove excess conductor material outside the narrowed aperture (column 8, lines 25-31).

As to claim 2, Hause discloses that the step a) utilizes a dielectric material for forming the intermediate layer (104/106) (column 6, lines 15-24, lines 37-39) while a metallic conductor material is used in the step e) (column 8, lines 22-23).

As to claim 3, Hause discloses that the step d) comprises the deposition of a layer of an insulating coating material (column 7, lines 12-15), followed by the anisotropic etching of this layer so as to preserve a part thereof on the side-walls of the aperture (column 7, lines 19-21; Figure 6).

Art Unit: 1765

As to claim 7, Hause discloses that apertures are etched which extends right through the intermediate layer (104/106) (Figure 7).

As to claim 8, Hause discloses the mask (108) is formed by means of a photolithography technique (column 6, lines 49-53), and in which the narrowed apertures have dimensions (d) which are referred to as "ultimate" dimensions which are smaller than those that can be achieved by means of said photolithography technique (column 8, lines 36-44).

As to claim 9, Hause discloses that the electrical connections comprise wiring tracks and/or terminals and/or vias between layers (column 8, lines 9-11; Figure 8).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hause, in view of Wolf, Silicon Processing for the VLSI Era, Vol. 4, Lattice Press (2002).

As to claim 4, Hause does not expressly disclose that the sidewalls of the aperture are coated by means of a dielectric material having a low dielectric constant (k).

Art Unit: 1765

However, Wolf teaches that low-k dielectric films are important in integrated circuit applications because they can significantly improve circuit performance characteristics (page 639).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a dielectric material having a low dielectric constant (k). One who is skilled in the art would be motivated to use a material that can significantly improve circuit performance characteristics.

As to claim 5, Hause does not expressly disclose that the dielectric material of the coating layer is chosen from among fluoruous glass, glass deposited by spinning and silicon oxide containing carbon. Wolf teaches that silicon oxide containing carbon (or C-dope oxide (Si-O-C)) is a commonly used low-k material (page 646, Table 14-3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a dielectric material of the coating layer chosen from silicon oxide containing carbon. One who is skilled in the art would be motivated to use a commonly used low-k material, known to possess the characteristics to be successfully used in an integrated circuit.

As to claim 6, Hause discloses that the window of the mask (108) registers with at least one active part of the substrate (102) (column 6, lines 7-14) (from Figure 3, the window in mask (108) overlies (102). Hause does not expressly disclose that said active part of the substrate (102) is exposed during the etching of the intermediate layer of material through the window of the mask (Figure 4).

However, Hause discloses that (104) is silicon oxide (column 6, lines 15-18). Additionally, Wolf teaches that low-k dielectric films. (i.e., $k < 3.9$ for silicon oxide) are important in integrated circuit applications because they can significantly improve circuit performance characteristics (page 639). Thus, there is a suggestion for exposing the active part of the substrate (102) during the etching of the intermediate layer of material through the window of the mask, because performing this step would reduce the volume of silicon oxide, replacing this material with the low-k dielectric side-walls, as in the combined teachings.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to expose the active part of the substrate during the etching of the intermediate layer of material through the window of the mask.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Remarks

It is noted that the abstract submitted on 8/19/04 shows multiple paragraphs and "Fig.6" printed at the end of the paragraphs. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (571) 272-1457. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone

Art Unit: 1765

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Shamim Ahmed
Primary Examiner
Art Unit 1765

SA
October 22, 2006